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Fourth Semester B.E. Degree Examination, June 2012
Microcontrollers

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting
at least TWO questions from each part.**

PART – A

- 1
 - a. Explain briefly the Harvard and Von-Neumann CPU architecture. (06 Marks)
 - b. Sketch the internal block schematic of 8051, list its salient features and briefly explain its register set. (10 Marks)
 - c. Briefly explain the dual functions of port-3 pins of 8051. (04 Marks)

- 2
 - a. Briefly explain any four addressing modes of data of 8051 with an example for each. (06 Marks)
 - b. Explain the operations of the 8051 instructions:
i) RLC A ii) DA A iii) MUL AB and iv) AJMP addr (08 Marks)
 - c. Write an ALP (assembly language program) in 8051 to count the number of positive and negative numbers present in the internal memory block starting with the address 20H, containing N bytes. Store the counts after the last data byte in the memory block. (06 Marks)

- 3
 - a. Briefly explain the different assembler directives used in an assembly language program. (04 Marks)
 - b. Write an 8051 ALP to find the value of N!/R! using a subroutine that calculates the factorial of a given number. Assume the values of N and R are stored in locations 10H and 11H. Store the value of N!/R! in 12 H. Assume N!, R! and N!/R! are all maximum 8 bit values. (10 Marks)
 - c. Write an 8051 software time delay subroutine to generate a time delay of 100 µsec when called. Assume crystal frequency as 12 MHz. Show delay calculations. Do not use timers. (06 Marks)

- 4
 - a. Interface an LCD display unit to 8051 and write an ALP to display the message 'DONE'. (10 Marks)
 - b. Interface a stepper motor to 8051 and rotate it by checking the status of a simple toggle switch connected to pin P2.0 as follows:
i) If switch is open rotate motor in clock wise direction.
ii) If switch is closed rotate motor in counter clockwise direction. (10 Marks)

PART – B

- 5
 - a. With regard to the interrupts of 8051,
i) Give the vector addresses of the interrupts.
ii) Briefly explain the procedure of enabling / disabling the entire interrupt system and enabling / disabling of individual interrupts.
iii) Indicate the default priority on reset and procedure to alter this default priority. (06 Marks)
 - b. With regard to timers of 8051,
i) Explain briefly the difference between the timer and counter operation modes.
ii) Indicate how to start / stop the timer if GATE control is also used.
iii) Explain mode – 2 operation. (06 Marks)
 - c. Write an ALP in 8051 to generate a square wave of frequency 5 kHz on pin P2.7 using Timer-1 in interrupt mode. Assume crystal frequency as 11.0592 MHz. (08 Marks)

- 6** a. i) Explain briefly the asynchronous serial communication format.
ii) Indicate steps of programming 8051 to transmit a character and receive a character serially. **(09 Marks)**
- b. Write a 8051 C program to transmit the character '*' continuously serially in the 8 bit, 1 start bit, 1 stop bit, 2400 baud rate format. Assume the crystal frequency as 11.0592 MHz. **(08 Marks)**
- c. What is the advantage of using the chip 8255 with 8051? Indicate the functions of the pins A₀ and A₁ of 8255. **(03 Marks)**
- 7** a. Explain the architecture of MSP430 with its internal block schematic. **(10 Marks)**
- b. Give the details of memory map of MSP430. **(06 Marks)**
- c. Write a note on clock system of MSP430. **(04 Marks)**
- 8** a. Write an assembly program to generate a waveform with ON time of 7msec and OFF time of 21 msec on P0.5. Assume XTAL of 11.0592 MHz. Use timer 0. **(12 Marks)**
- b. Explain the bits of SCON register. **(08 Marks)**

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